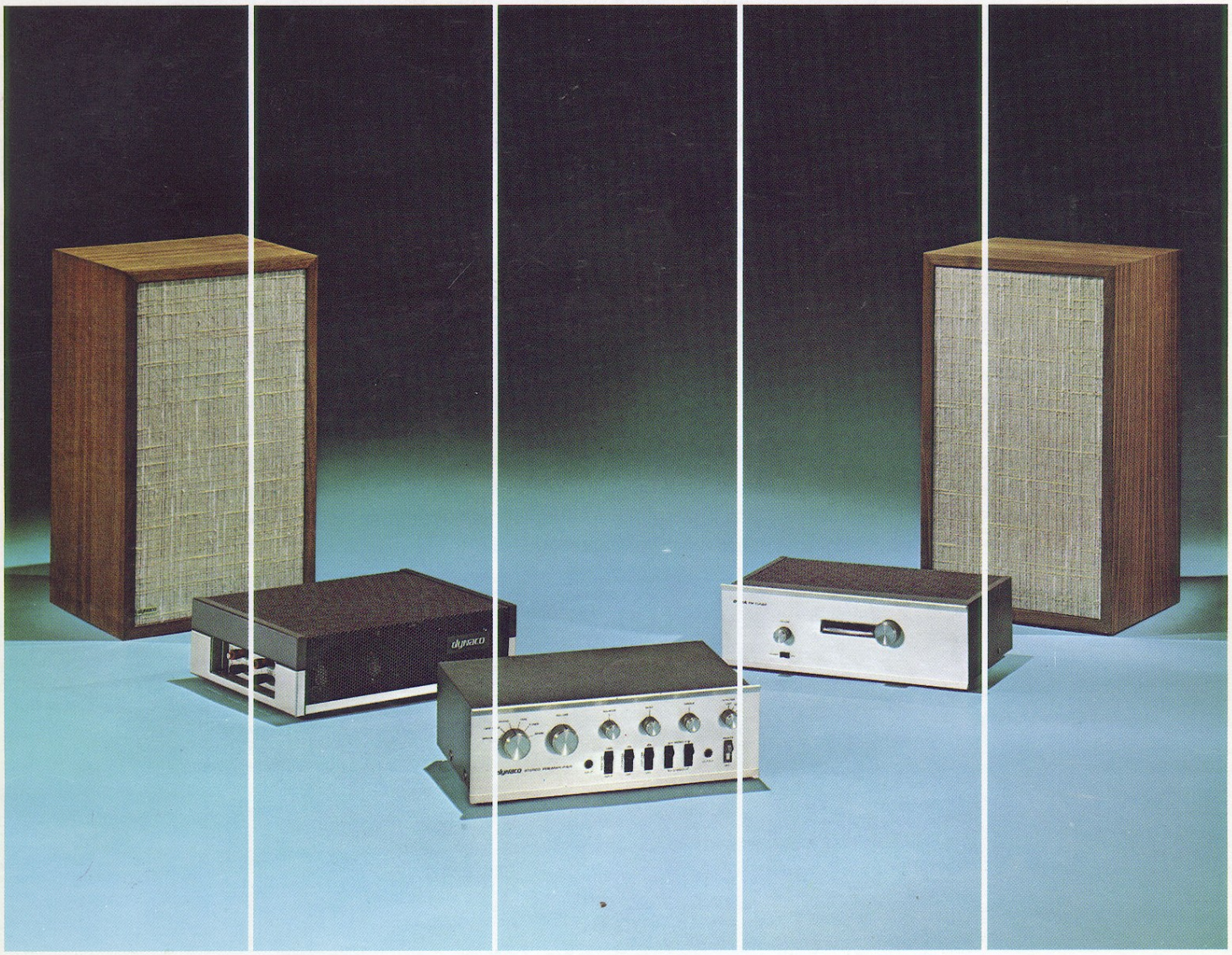
dynaco

HIGH FIDELITY COMPONENTS FOR THE AUDIO PERFECTIONIST



WHAT IS DYNACO COMPONENT STEREO?

The widely varying quality of stereophonic sound in homes, automobiles, boats and airplanes makes it apparent that the word "stereo" is in itself no guarantee of high quality sound reproduction. Either stereo (two channel) or monophonic (single channel) sound may be low-fi, medium-fi, or truly high fidelity. A lesser quality stereo system will reproduce program material with less realism than a high fidelity monophonic system. Because the added dimensional sense of stereo tends to involve the listener more, distortion in stereo is more irritating than in mono. A low distortion component stereo system is the most exacting way of re-creating the original performance in your living room.

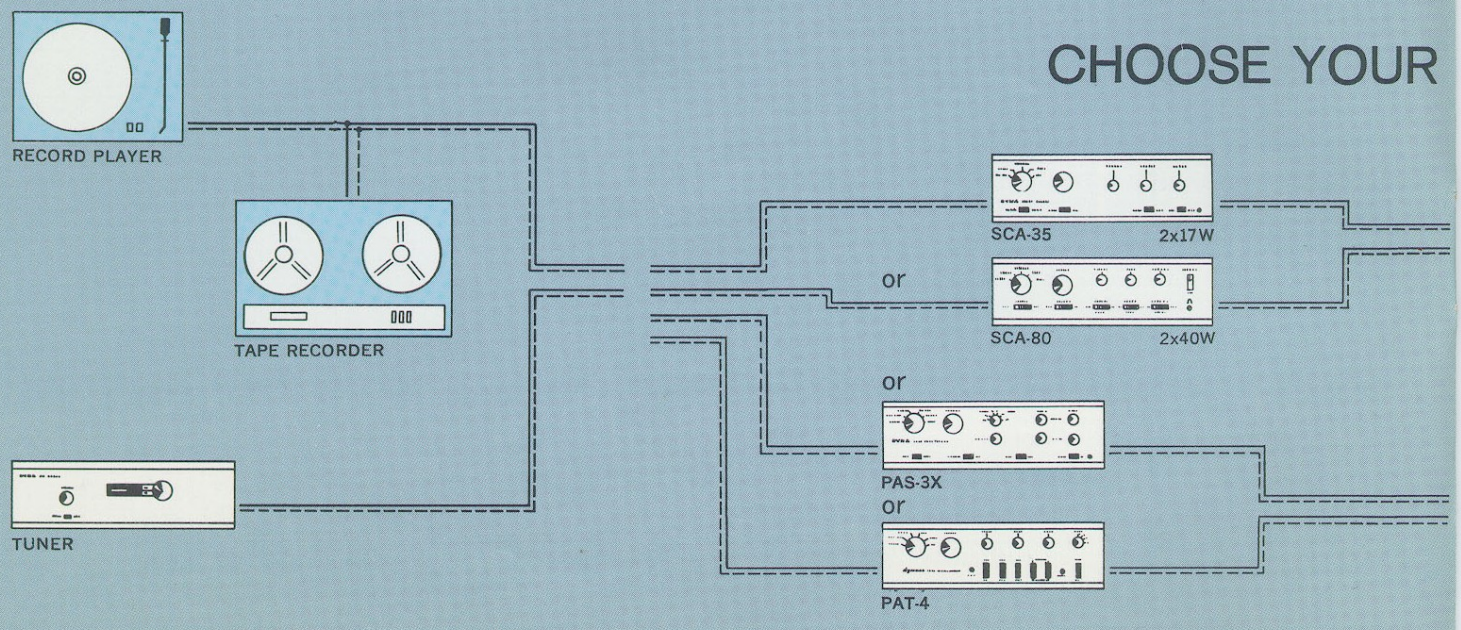
All stereo music systems consist of a signal source which is amplified and controlled to the point where it can drive loudspeakers. The various amplification and control functions are performed by different components. When these components are combined in the same cabinet and sold under one brand name, the resulting set is a "console". Commercial consoles place heavy emphasis on the furniture, as opposed to just the "guts". The single console cabinet in which the two stereo speakers are also housed restricts separation, which prevents optimum stereo and results in inevitable performance compromises. With component stereo, you interconnect the separate components, each selected for your specific needs. They need not be placed in a single cabinet, but bookshelves, a room divider, or an end table may be utilized for greatest operating ease, and to facilitate integration of the music system into existing furnishings. The loudspeakers are in independent cabinets to enable best placement in the room and adequate separation for more realistic stereophonic reproduction.

Dynaco produces a complete line of electronic components, plus a loudspeaker system. This equipment has been painstakingly designed so that it is essentially obsolescence-proof. The best evidence of its longevity is the continued popularity of the Stereo 70 power amplifier and PAS preamplifier—the most widely-used such components for over a decade.

The advanced design, proven reliability, top-flight performance and recognized value maintain the demand for all Dynaco components. Even as used equipment, they maintain their value, not only because they still meet specifications years later, but also because that same model is still current and unchanged.

Dynaco electronic components include separate preamplifiers and power amplifiers, FM tuners, and integrated amplifiers. The advantages of separate components, as opposed to the unified tuner-preamplifier-power amplifier, or "receiver", lie in more flexibility, power, performance, maintenance convenience, and protection of the full investment from obsolescence. It is easy to step up to a higher power amplifier, or go from a Dynaco tube unit to a Dynaco transistorized version because of their complete interchangeability. Even the cabinet cut-outs remain

CHOOSE YOUR



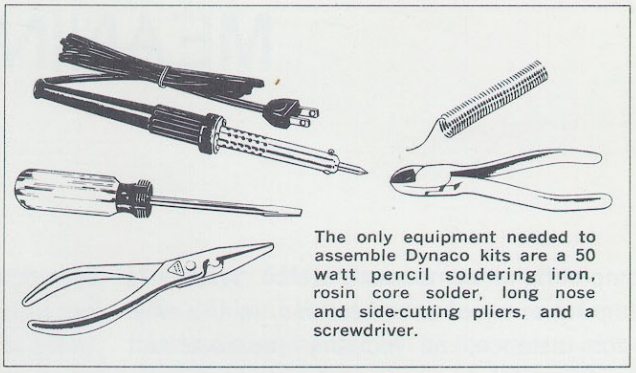
the same for preamps, tuners, and the integrated amplifiers.

The utterly unprecedented longevity of Dynaco equipment is the direct consequence of our design philosophy — simplicity, reproducibility, impeccable performance—all at a price a fraction of other comparable equipment. Dynaco engineers do not use the brute force approach of adding part after part in evolving a design. Rather, their design philosophy is to create new circuits whose ordered simplicity is truly sophisticated and the culmination of painstaking "distillation". The simpler the circuit, the more reliable and reproducible it will be, both in the factory assembled versions and in the hands of the novice kit-builder.

The sophistication of Dynaco circuitry is an indispensable attribute of the kit's ease of construction. The only tools required for assembly are a pencil soldering iron, rosin-core solder, long nose and side-cutting pliers, and a screwdriver. All Dynaco kits have built their deserved reputations on consistent assurance of meeting specifications so long as the instructions are followed. And if the average kit-builder has been so successful with Dynaco kits, then the same units factory-built are likewise assured of consistently high quality.

A further benefit of design simplicity is the lower cost at which Dynaco products can be offered. While many factors, including the satisfaction of self-participation, influence music-lovers to build kits, it is our belief that the most important factor for the continued popularity of Dynaco kits is the significant savings that can be enjoyed for comparable performance, if indeed comparable performance is available anywhere else at any price.

It is evident that equipment which is properly designed at its inception does not require periodic redesigning. The attendant savings achieved by avoiding additional engineering and esthetic changes are passed on to you in the form of much lower prices than would otherwise be possible. The Stereo 70 still sells for $99.95—the same price as in 1959.



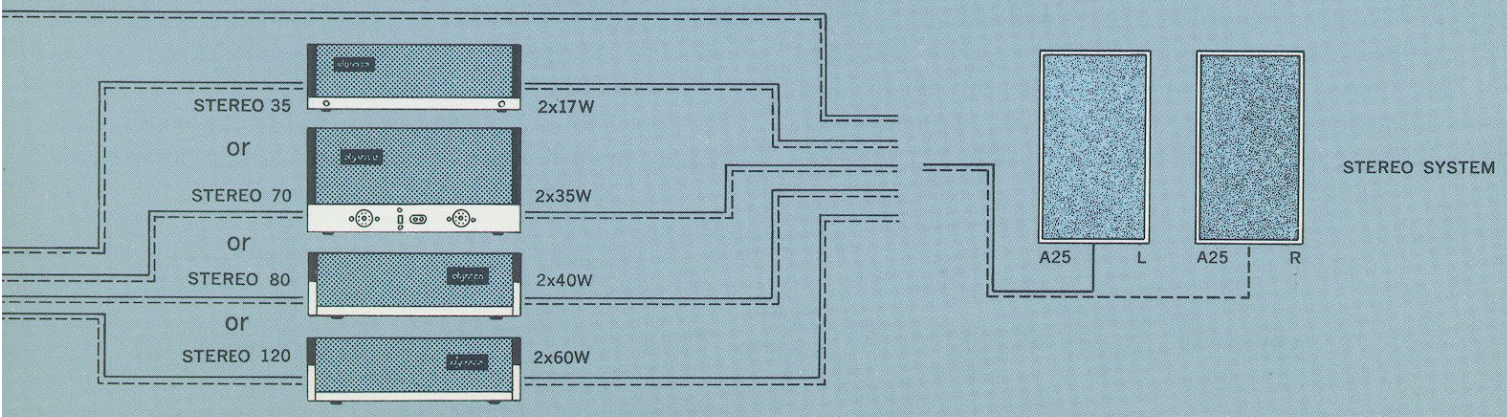
The only equipment needed to assemble Dynaco kits are a 50 watt pencil soldering iron, rosin core solder, long nose and side-cutting pliers, and a screwdriver.

Dynaco's long warranty, too, demonstrates our confidence in our designs. All parts in the kits (except tubes) are warranted a full year, not just 90 days. And on factory built units, the one year warranty covers all labor as well. The speaker components are warranted a full 5 years.

If you've never before enjoyed the thrill of building your own, and you'd like to try, it requires only some patience in learning to make a secure solder connection, very modest mechanical ability, and willingness to follow directions. We suggest you build the power amplifier first, then the preamp, and finally the tuner.

You need never fear that a Dynaco purchase today will be out of date tomorrow. The best reason for buying Dynaco today is that it will fill your needs today and for many years to come.

COMPONENT STEREO SYSTEM



WHAT SPECIFICATIONS ARE MEANINGFUL?

The person contemplating a component stereo system is faced with a bewildering array of specifications. In the case of loudspeakers, for instance, no industry measurement standards exist. Members of the component trade association cannot agree on what loudspeaker specifications are truly meaningful, much less what measuring standards should be used. While industry standards for tuners and amplifiers have been adopted, Dynaco feels that they are misleading and incomplete. After all, the purpose of specifications is to afford a basis for comparison so the specifications themselves should be able to indicate which component is more suitable. Yet units having similar specifications will frequently not sound alike. Such specifications therefore are neither meaningful nor complete.

Dynaco engineers have devoted much time to investigating the factors which correlate with listening qualities, and we feel that one factor basic to the sustained acceptance of all Dynaco products is the singularly appropriate parameters always used in their design. The following discussion highlights the details of those parameters we think are meaningful in the design of amplifiers, tuners, and speakers.

1. AMPLIFIERS The most commonly advertised amplifier specification is power. All Dynaco power ratings are the true sustained power the unit will deliver—the steady-state (rms) power. Many other manufacturers use qualifying terms such as EIA, IHF music power, dynamic power, ±1 db, and so on, which have the sole attribute of appearing as a superficially higher advertising claim. Actually, the use of any power rating other than the steady-state (rms) method is a subterfuge to hide a lower true power rating.

Our insistence on using the accurate and more conservative rms power rating may, at first glance, put Dynaco amplifiers in a less favorable light. But when Dynaco equipment is compared to other units using the same rigorous rms specifications, the outstanding value of the Dynaco line becomes readily apparent. The 80-watt Dynaco SCA-80 delivers more than twice the rms power at 20 Hz than many other amplifiers carrying qualified 170 watt ratings.

Many other manufacturers use qualifying terms such as EIA, IHF music power, dynamic power, ±1 db, all of which are all subterfuges to hide the unit's actual lower rms power capabilities. For instance, "dynamic" power is usually far greater than the rms power—the poorer the power supply regulation, the greater the difference between dynamic power and the rms power. As the 1970 Stereo HiFi Directory noted, dynamic power ". . . is an example of a design deficiency being turned into a promotional advantage."

The second most commonly advertised amplifier specification is harmonic distortion. We believe that the bare number itself is not as pertinent as the distribution of the distortion products, particularly in the odd order harmonics, which are the most offensive to the ear. Equally important is low intermodulation distortion (IM), as well as the amplifier's distortion characteristics at reduced power. The distortion of many transistorized amplifiers actually increases as power is reduced. These factors explain the strident sound of many amplifiers on the market today.

Other pertinent considerations in the design of an amplifier are its noise level (and the noise frequencies), recovery time (a function of power supply design), transient and frequency response, accuracy of equalization and distortion through the magnetic phono inputs (as well as the typically specified high level inputs), inherent distortion before feedback is applied, and stability under the divers conditions encountered when driving either conventional or electrostatic loudspeakers.

2. FM TUNERS For anyone living in a major metropolitan area, a tuner's sensitivity is one of the least important con-

siderations. Far more germane are AM (amplitude modulation) rejection, selectivity (the ability to separate closely-spaced stations), resistance to overload so that strong stations will not block out weaker ones at random points along the dial, noise rejection, and tuning precision so that optimum quieting occurs at exactly the same point as lowest distortion.

The present industry standard for measuring distortion applies to monophonic reception only, yet distortion is invariably higher in stereo. We know of no stereo tuners other than Dynaco's for which the manufacturer publishes the distortion figure for stereo. Therefore, published distortion figures lend no help whatsoever in determining how a tuner will sound under the more difficult condition. Furthermore, the presence of "multipath" disturbances (the aural equivalent of "ghosts" on TV) presents a far more severe problem in stereo than mono reception, and is audibly irritating. Multipath effects are received as amplitude modulation (AM) which is highly undesirable in FM (frequency modulation) reception. The better the ability of the stereo tuner to reject amplitude modulation, the less detrimental will be the effects of multipath dispersion. Dynaco tuners are designed for optimum AM rejection and low inherent stereo distortion. Furthermore, since the Dynaco tuners have minimum distortion when tuned to receive the strongest signal, their effective sensitivity (ability to receive weak stations with low distortion and good noise suppression) makes them sound considerably better than conventional sensitivity specifications would imply.

3. LOUDSPEAKERS No industry standards exist for measuring loudspeakers. The Dynaco speaker system is designed to provide the optimum balance of the various factors affecting natural sound . . . extent and smoothness of frequency response, dispersion characteristics, harmonic distortion (and the distribution of this distortion in the higher order harmonics), Doppler distortion (in which excessive low frequency excursions shift the pitch of high frequencies emanating from the same cone), and transient response. Qualitative evaluations of loudspeakers require a composite body of tests plus listening comparisons under identical conditions.

This brief discussion emphasizes the subtleties underlying the design of high fidelity components. Dynaco equipment is a reflection of the goals to which it is designed, and since considerable controversy exists over what these goals should be, a thorough appreciation of the factors constituting high quality sound reproduction is indispensable.

Dynaco equipment is designed for highest quality with simple, reproducible designs which stand the critical test of listenability as well as elaborate and extensive laboratory examination. The total appropriateness of Dynaco's philosophy is attested by its longevity which is unique in the components industry.

TRANSISTORIZED CONTROL AMPLIFIER SCA-80

The SCA-80 is a one-piece, transistorized integrated package combining the Stereo 80 power amplifier with a pre-amplifier having all the quality and many of the features of the PAT-4.

An extremely cool operating amplifier, the SCA-80 will deliver a full 40 watts rms per channel from 20 Hz to 20 kHz with both channels driven simultaneously. Distortion at rated output is less than ½% IM and ½% harmonic, and decreases with reduced power. The patented Dynaco protection circuit automatically resumes program material after abusive conditions (e.g. shorted speaker leads) are remedied.

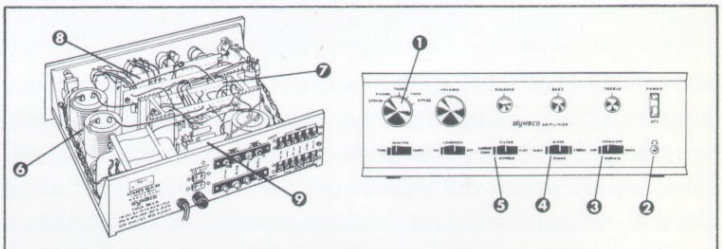
Sophisticated switchable features such as loudness, filters, blending, and tape monitor are provided, yet the SCA-80 is simple to operate with a basic two-knob control action. A front panel headphone jack and switching provisions for two sets of stereo speakers are provided. Listening is greatly enhanced by the extraordinary quiet preamplifier section—even when the volume control is at its full setting.

The universal power transformer supplied with the SCA-80 has multiple primary windings so that regardless of where you live, the amplifier will deliver its full rated power.

PRICE: Kit **$169.95** East; $174.95 West
Assembled **$249.95** East; $254.95 West

SPECIFICATIONS

Harmonic distortion: Less than 0.5% at any power level up to 40 watts rms per channel into 8 ohms at any frequency between 20 Hz and 20 kHz with both channels driven simultaneously. Distortion reduces at lower power levels. **Intermodulation Distortion:** Less than 0.5% at any power level up to 40 watts rms per channel into 8 ohms with any combination of frequencies. Distortion reduces at lower power levels. **Power Bandwidth (IHF):** 6 Hz to 50 kHz, at less than 0.5% total harmonic distortion into an 8 ohm load. **Clipping Point at 1000 Hz, one channel only:** 50 watts rms at 8 ohms; 36 watts rms at 4 ohms; 26 watts rms at 16 ohms. **Input Sensitivity:** Phono: 3 mV for 40 watts rms output; High Level: .13 V for 40 watts rms output. **Impedances:** Magnetic Phono Input: 47,000 ohms; High Level Inputs: 100,000 ohms; Tape Output: from low level inputs—600 ohms; from high level inputs—same as source; Headphone output: 8 ohms or greater. **Frequency Response at 1 watt:** Phono: ±0.5 db of RIAA equalization; High Level: ±0.5 db 15 Hz. to 50 kHz. **Tone control action:** ±12 db @ 50 Hz and 10 kHz. **Hum and noise:** Phono better than 60 db below rated output. High Level better than 80 db below rated output. **Separation:** 65 db by IHF standards; 50 db or more from 20 Hz to 10 kHz. **Semiconductor complement:** 20 transistors, 10 diodes. **Dimensions:** 13½" x 10" x 4¼" high. Weight 16 lbs. (7.2 kg). **Power consumption:** 35 watts quiescent, 250 watts max. 50-60 Hz AC, universal voltage.



❶ Selector switch includes position for "special" low level input. Can be equalized for dynamic microphone or second phono cartridge.
❷ Low impedance front panel headphone output is always live.
❸ Three position switch permits headphone operation with or without speakers, as well as remote speaker operation.
❹ Three position mode switch includes a "BLEND" position. Enables a center channel to be driven without any auxiliary amplifier.
❺ Three position filter switch provides for both high and low frequency filters or low frequency filter only.
❻ 5000 μfd output coupling capacitor in each channel extends low frequency power capabilities. 7200 μfd power supply filtering provides more low frequency power, better low frequency separation, improved power supply regulation, and lower hum.
❼ Factory-assembled and tested etched circuit boards (one for each power amplifier section) slide into grooves in extruded black anodized heat sinks. No further adjustments or test equipment needed.
❽ Factory-assembled and tested etched circuit boards for preamps.
❾ Patented Dynaco current limiting circuit protects against shorted speaker leads and other abusive conditions. Operation automatically recommences after overload is removed.

STEREO CONTROL AMPLIFIER SCA-35

The SCA-35 is a one piece combined preamplifier/power amplifier. It is the best value of all the Dynaco components and can deliver half again as much steady-state power at the audio extremes as many other units advertised at twice the wattage.

The SCA-35 is a completely proven amplifier. Since its introduction in 1963, literally tens of thousands have been built from kits or acquired factory assembled. Even though an integrated amplifier, it maintains Dynaco's reputation for easy-to-build kits, as attested by High Fidelity Magazine:

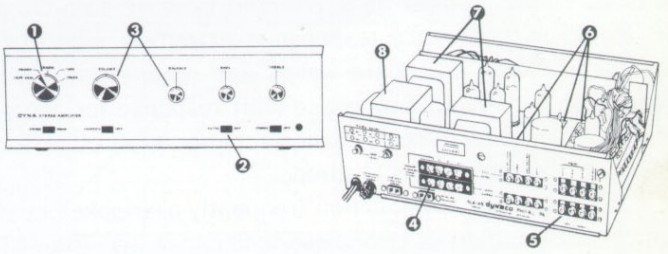
"Building the SCA-35 offered no problems, and several hours of pleasant diversion, to the kit enthusiast. The printed circuit boards are supplied with parts already mounted, and wiring to them and to the rest of the chassis is fairly simple because of the happy absence of crowded areas. The instruction manual is clearly written and excellently illustrated. Total working time was eight hours."

The result, the magazine went on, ". . . is, in a word, an excellent amplifier—especially so in view of its cost."

PRICE: Kit **$ 99.95** East; $104.95 West
No longer available factory assembled

SPECIFICATIONS

Power output: 35 watts rms (both channels driven) at 1000 Hz; 28 watts rms (both channels driven) at 20 and 20,000 Hz (Either channel alone 17.5W rms from 20-20,000 Hz). **Distortion:** Harmonic distortion under 1% at rated output. Intermodulation distortion under 1% at rated output. Both Harmonic and IM distortion decrease as power is decreased; below 0.2% at average listening levels. **Frequency response:** ±0.25 db from 20 Hz to 20 kHz. **Tone controls:** ±12 db at 50 Hz and 15 kHz. **Input signal required for rated output at 1 kHz:** 4 mV magnetic phono, 2.5 mV tape head, 1 V high level inputs. **Hum and noise:** 70 db below 10 mV on low level inputs, 80 db down on high level inputs. **Front panel controls:** Selector, volume, balance, bass, treble. **Front panel switches:** stereo-mono, loudness compensation, bandpass filter, power. **Rear panel inputs:** RIAA magnetic phono (high and low level), NAB 7½" tape head, Radio, Tape and Spare. **Rear panel outputs:** 8 and 16 ohm speaker, tape output (unaffected by balance tone and volume controls), center channel output (no auxiliary amplifier needed), provision for headphone connection, two AC convenience outlets. **Rear panel controls:** Dual hum balancing pots. **Tube and semi-conductor complement:** 12AX7 (2), 7199 (2), 6BQ5 (4); 2 silicon diodes. **Power consumption:** 100 watts @ 120 V, 50/60 Hz. 120/240 V power transformer available on special order. **Dimensions:** 13½" x 10½" x 4¼" high. **Shipping Weight:** 20 lbs. (9.1 kg.) Charcoal brown baked vinyl cover included.



❶ Input selector permits choice between phono, tape head, and three high level sources.
❷ Exclusive bandpass filter eliminates rumble and scratch without destroying the musical balance.
❸ Functional, easy-to-understand controls make it easy for the whole family to use, with sufficient flexibility for the enthusiast's subtle adjustments.
❹ Speaker terminal connectors provided for driving a center speaker. No other amplification required.
❺ Inputs for low or high output magnetic cartridges as well as ceramic cartridge provided.
❻ Three preassembled etched circuit boards reduce assembly time. No adjustments of any kind are required.
❼ Specially engineered Dynaco output transformers have phase reversal frequency in excess of 300 kHz to provide complete stability regardless of speaker load.
❽ 120/240 V, 50/60 Hz AC power transformer available on special order for overseas use.

TRANSISTORIZED STEREO PREAMPLIFIER PAT-4

The PAT-4 is a solid state counterpart of the renowned PAS-3X Dynaco stereo preamplifier, providing the same superior performance with a number of added features. The PAT-4 can be used with any tube or transistorized Dynaco power amplifier or virtually any other power amplifier, tube or transistor. Available either as an easy-to-build kit for the hobbyist, or fully assembled and tested, the PAT-4 harmonizes with the Dynaco FM-3 stereo tuner and is directly interchangeable with the PAS-3X in cabinet installations.

The PAT-4 exemplifies Dynaco's long-standing reputation for excellence achieved through innovation and a constant striving for simplicity in both engineering and operation. A remarkably low level of noise and distortion has been achieved—below the level which can be measured with commercial grade test equipment—through the use of carefully selected silicon transistors in a circuit utilizing both DC and AC feedback. Frequency response is extremely wide to prevent deformation of square waves and other signals which depend on wide-band, low phase shift response for accurate reproduction. Overall performance superior to all other transistorized preamplifiers is assured.

An important specification frequently overlooked in evaluating preamplifiers is phono overload capability. The PAT-4, with its 80 mV phono overload point, cannot be overloaded by any magnetic cartridge made today. Transistorized preamplifiers in particular frequently have had poor phono overload characteristics (less than 60 mV) and in the absence of any such overload specification, you have no assurance that the phono stage will not distort severely on many loud passages.

The PAT-4 kit is supplied with two identical preassembled etched circuit boards which include virtually all the components except the power supply and the controls, greatly simplifying and speeding construction of the kit, and assuring optimum operation and absolute reproducibility on completion. Each circuit board has been in-circuit tested prior to shipment. An open, uncluttered chassis layout provides ready access for assembly and trouble shooting.

Like all Dynaco products, the PAT-4 is the culmination of years of painstaking design. It has been acclaimed by renowned audio experts, like Julian Hirsch, who wrote in Stereo Review: "In sonic quality, we would unhesitatingly say that the Dynaco PAT-4 is unsurpassed by any preamplifier we have seen . . . a remarkable unit and unmatched at anywhere near its low price . . ." The Stereophile magazine was even more emphatic about the sonic quality of the PAT-4: ". . . we cannot see how any preamp, present or future, could surpass the PAT-4."

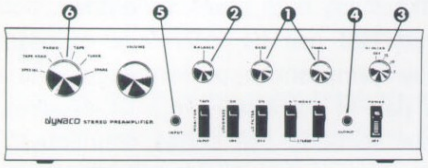
SPECIFICATIONS

Frequency Response: High Level inputs ±0.5 db from 10 Hz to 100 kHz.
Low Level inputs ±1 db from 20 Hz to 20 kHz (equalized)
Distortion at rated 2 volt output: THD less than 0.05% 20 Hz to 20 kHz; IM less than 0.05% with any combination of test frequencies.
Hum and Noise: Magnetic Phono: 70 db below a 10 mV input signal. High Level: 85 db below a 0.5 volt input signal.
Gain: Magnetic Phono: 54 db at 1000 Hz (3 mV for 1.5 V out)
High Level: 20 db (.15 V for 1.5 V out).
Tone Control Range: ±16 db @ 50 Hz. ±12 db @ 10 kHz.
Maximum Output: 10 volts into high impedance. 5 volts into 600 ohms.

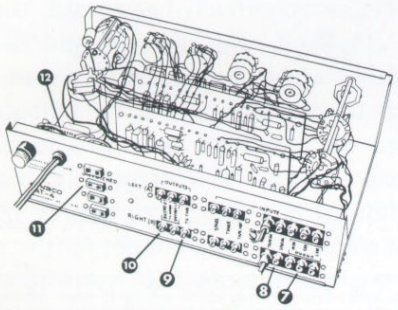
Impedances:		
Magnetic Phono:	47,000 ohms	To Tape: from low level inputs, 600 ohms
Tape Head:	100,000 ohms	
High Level:	100,000 ohms	To Tape: from high level inputs, same as source
Audio Output:	600 ohms	
Amplifier Input:	Nominal load 10,000 ohms or higher	

Inputs: Low level or high level RIAA magnetic phono or ceramic phono; NAB 7½" tape head; Special (normally microphone); Tape amplifier; Tuner; Spare high level for TV, etc.; Front panel high level.
Outputs: Tape output ahead of controls; 2 Audio outputs (one switched by front panel jack); Front panel output.
Front Panel Controls: Selector switch; Volume control; Balance control; 2 Bass controls; 2 Treble controls; High Filter switch @ 15 kHz, 10 kHz and 7 kHz; Loudness Compensation switch; Tape Monitor switch; Low Filter switch; paired Stereo-Mono switches to provide A or B channels independently or combined (A+B) with 6 db blend for 3rd channel output, or stereo; illuminated power switch
Semiconductor Complement: 8 transistors; 2 diodes.
Dimensions: 13½" x 9" x 4¼" high (same as PAS-3x).
Shipping Weight: 10 lbs. (4.5 kg.).
Power Consumption: 5 watts, 120/240 V, 50/60 Hz, AC.

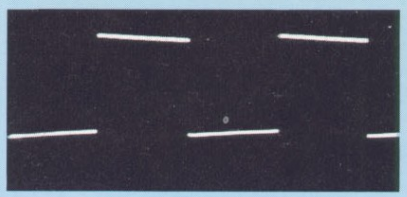
PRICE: Kit **$ 89.95** East; $ 94.95 West
Assembled **$159.95** East; $164.95 West



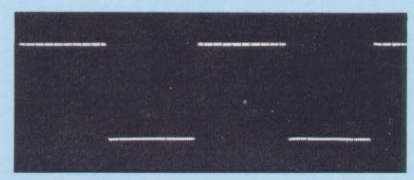
❶ Four bass and treble controls use independent, concentric knobs. Patented tone control circuit provides smooth, continuous adjustment with a true "center-flat" position without requiring disabling switches.
❷ Balance control provides critical adjustments of small differences through first 90° rotation from center, yet allows complete cancellation of either channel at its extremes.
❸ Rotary high frequency filter switch has a "flat" position plus three ½ octave steps (at 15 kHz, 10 kHz, and 7 kHz) of 12 db/octave.
❹ 600 ohm output for headphones or tape recorder which provides more gain than the conventional back panel tape recorder output, and enables full use of all controls when making a tape recording.
❺ Front panel stereo input for high level source such as guitar amplifier or tape recorder. A mono input here can be combined with other mono program material from another source on the other channel if desired.
❻ Phono input accommodates both high and low level magnetic cartridges. Overload point is 80 mV on phono low.



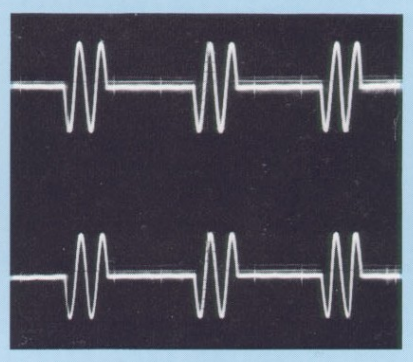
❼ Separate input for ceramic cartridge.
❽ "Special" low level input provides optional equalization choices (second phono, second tape head, or microphone).
❾ Conventional tape output unaffected by front panel controls other than input selector.
❿ Second audio output (in parallel to main output) for use when it is desired to silence loudspeakers while listening to headphones. This second audio output can also be used for tape recording whenever higher gain and all front panel controls are desired.
⓫ Top two AC outlets are always live; bottom two AC outlets are controlled by PAT-4 power switch.
⓬ Standard power transformer has dual primary windings for either 120/240 V, 50-60 Hz AC.



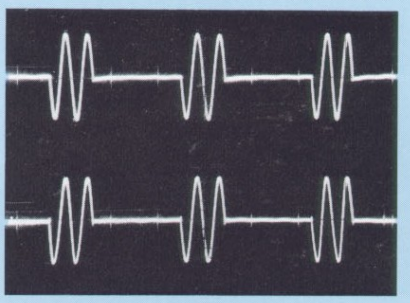
100 Hz Square Wave



10 kHz Square Wave

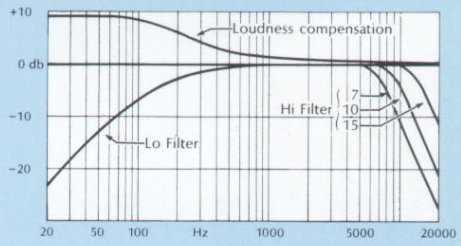


2 cycle 100 Hz Tone Burst

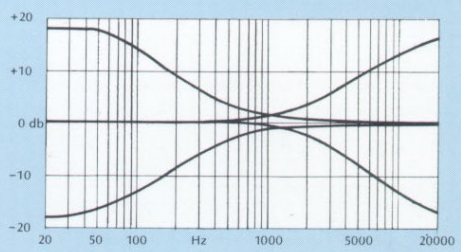


2 cycle 10 kHz Tone Burst

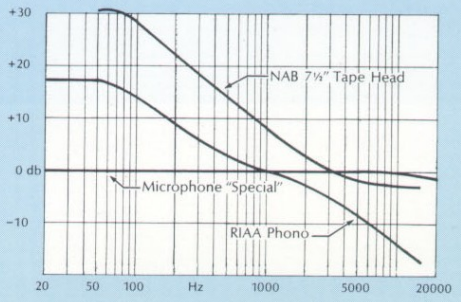
Tone bursts are indistinguishable at output of PAT-4 (top) from generator output (bottom).



Filter Action



Tone Control Range

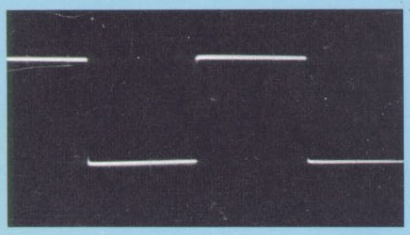


Equalization

TRANSISTORIZED POWER AMPLIFIERS STEREO 120 AND STEREO 80

These two transistorized power amplifiers reflect the ingenious design approaches characteristic of the entire Dynaco line. Both employ basically the same audio circuitry and components. Their essential difference is in their power supplies —the Stereo 120 employs a fully-regulated power supply so that its power supply voltages are the same at full rated output as they are under quiescent conditions even with varying line voltage. In this way, the Stereo 120 can deliver 50% more rated power than the Stereo 80 which incorporates a more conventional power supply.

100 Hz



1 kHz

10 kHz

Square Wave Performance: This is a good indication of linearity from 10 Hz to 100 kHz, since good square wave reproduction requires bandwidth in excess of 1/10th to 10 times displayed frequency.

The unique biasing system (patents pending) of both amplifiers sharply reduces the inherent non-linearities of their solid state devices, markedly reducing distortion at low power without any need for periodic adjustments. The biasing arrangement is an integral part of the automatic electronic protection circuit—a Dynaco exclusive.

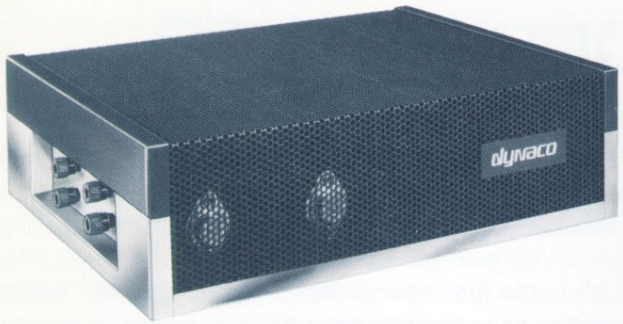
The highly reproducible circuits used in these amplifiers have made them particularly suitable as kits. Stable circuits with DC feedback control of transistor characteristics enable a consistent level of operation over a wide range of transistor characteristics. Rated performance can be obtained without adjustments of any kind as the bias is set automatically.

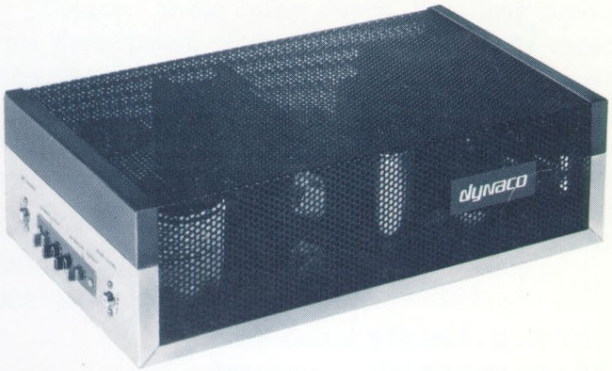
Unlike many high power amplifiers, both the Stereo 80 and Stereo 120 use no interstage or output transformers which may compromise performance. The low level driver utilizes a pair of transistors in a DC feedback configuration. The output sections use series connected push-pull transistors driven by a direct coupled complementary-symmetry driver, biased by Dynaco's unique circuit, and containing its own DC feedback connection to stabilize the operating characteristics.

The amplifiers are unconditonally stable with all loads and they easily handle all conventional loudspeakers including electrostatic types. They are both electronically protected against overload by strain or abuse (such as short-circuited speaker leads or excessive signals). The biasing circuits have inherent current limiting which will not permit power to be delivered into an abnormally heavy load. Under these conditions, the amplifiers will shut off and restore the sound instantaneously when the load is lightened, without the use of fuses, circuit breakers, or thermal cutouts.

Dynaco did not rush its transistorized designs. The result, as expressed by "The Stereophile" magazine is ". . . we are finally forced to do an about-face on our long-held conviction that transistor amps are not for the perfectionist. Not only does this one [Stereo 120] seem to have no sound of its own, it also makes most loudspeakers sound **better** than do tube amplifiers. This kind of performance, finally, justifies switching from tubes to transistors."

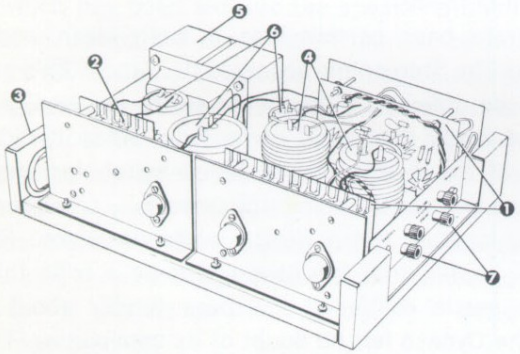
STEREO 120 PRICE: Kit **$159.95** East; $164.95 West
Assembled **$199.95** East; $204.95 West
STEREO 80 PRICE: Kit **$119.95** East; $124.95 West
Assembled **$159.95** East; $164.95 West





STEREO 120

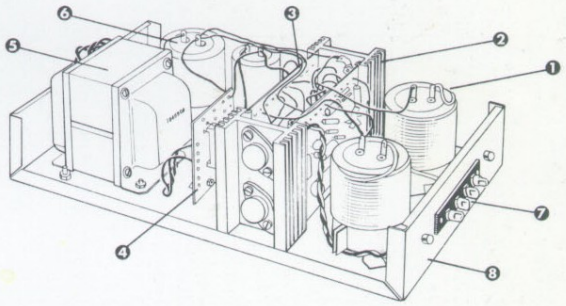
❶ Individual left and right channel etched circuit boards are preassembled and in-circuit tested at factory.
❷ Regulated power supply circuit board, also preassembled and in-circuit tested at factory.
❸ Heavy gauge, nickel-plated steel chassis.
❹ 3000 μfd output-coupling electrolytic capacitor used in each channel.
❺ Oversize standard power transformer has dual primary windings for 120/240 V, 50/60 Hz AC.
❻ 4800 μfd total capacitance in regulated power supply.
❼ Color coded speaker terminals are spaced to accommodate double banana plugs as well as spade lugs or stranded wire.



SPECIFICATIONS
Harmonic Distortion: Less than 0.5% at any power level up to 60 watts rms per channel into 8 ohms at any frequency between 20 Hz and 20 kHz; both channels operated with out-of-phase signals. Distortion reduces at lower power levels.
Intermodulation Distortion: Less than 0.5% at any power level up to 60 watts rms per channel into 8 ohms with any combination of test frequencies. Distortion reduces at lower power levels.
½% Power Bandwidth (IHF): 5 Hz to 50 kHz half power output at less than 0.5% total harmonic distortion into an 8 ohm load.
Clipping Point at 1000 Hz, one channel only: 60 watts rms minimum at 8 and 4 ohms; 35 watts rms minimum at 16 ohms.
Noise: 95 db below rated output unweighted with shorted input; 100 db down by IHF standards.
Separation: In excess of 70 db from 20 Hz to 20 kHz.
Input: 100,000 ohms; 1.5 volts for 60 watts rms output.
Semiconductor complement: 15 diodes, 15 transistors.
Dimensions: 13" x 10½" x 4" high. Weight: 20 lbs. (9.1 kg).
Power consumption: 35 watts quiescient; 400 watts maximum, 50-60 Hz, 100-120 or 220-240V AC.

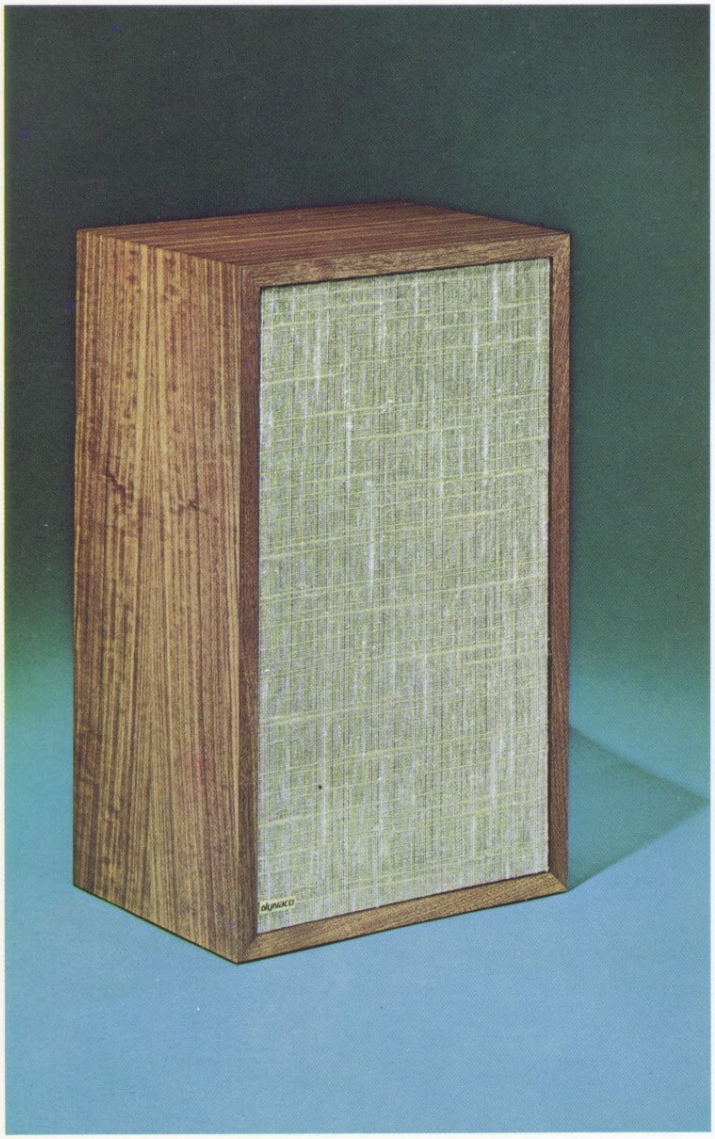
STEREO 80

❶ 5000 μfd output coupling capacitor used in each channel for extended low frequency power capabilities.
❷ Extruded, black anodized heat sinks provide effective heat dissipation for cool operation.
❸ Factory-assembled and tested etched circuit modules (one per channel) slide into grooves in heat sinks. No further adjustments or test equipment needed to enable assembled kit to meet factory specifications.
❹ Patented Dynaco current limiting circuit protects against shorted speaker leads and other abusive conditions. Operation automatically recommences after overload is removed.
❺ Oversize, universal 50-60 Hz AC power transformer.
❻ 6000 μfd power supply filtering provides more low frequency power, better low frequency separation, improved power supply regulation, and lower hum.
❼ Color coded, screw type speaker terminals aid in proper speaker phasing. Terminals can be finger-tightened without need for a screwdriver.
❽ Nickel-plated chassis enhances appearance and inhibits corrosion.



SPECIFICATIONS
Harmonic Distortion: Less than 0.5% at any power level up to 40 watts rms per channel into 8 ohms at any frequency between 20 Hz and 20 kHz with both channels driven simultaneously. Distortion reduces at lower power levels.
Intermodulation Distortion: Less than 0.5% at any power level up to 40 watts rms per channel into 8 ohms with any combination of test frequencies. Distortion reduces at lower levels.
½% Power Bandwidth (IHF): 8 Hz to 50 kHz half power output at less than 0.5% total harmonic distortion into an 8 ohm load.
Clipping Point at 1000 Hz, one channel only: 50 watts rms at 8 ohms; 36 watts rms at four ohms; 26 watts rms at 16 ohms.
Noise: Better than 90 db below rated output.
Separation: in excess of 60 db from 20 Hz to 10 kHz.
Input: 100,000 ohms; 1.3 volts for 40 watts rms output.
Semiconductor complement: 12 transistors, 10 diodes.
Dimensions: 14" x 8" x 4" high. Weight: 13 lbs. (6 kg).
Power consumption: 35 watts quiescent, 250 watts maximum, 50-60 Hz, 100, 120, 220 or 240V AC.

APERIODIC LOUDSPEAKER SYSTEM A-25



The A-25 is the first of a series of Dynaco speaker systems of aperiodic, or essentially non-resonant, design. The resulting constant impedance (less than 3 db variation throughout its bass range) yields a very wide and smooth frequency response which markedly improves transient response in the bass and midrange. The Stereophile Magazine wrote "This is one of the very few speaker systems we have ever heard that seemed to have virtually no sound of its own . . .if a speaker distorts instrumental timbres, no amount of dispersion or bass or treble range can make it any more accurate a reproducer of music. The speakers we put up against the A-25 were all outstandingly good in this respect [one is seven times as expensive], so we were most curious to see which, if any, the A-25 could match. Would you believe, the A-25's beat out all of them!"

Accurate bass performance is both clean and well-defined. As The Stereophile observed ". . . the A-25's seemed at first to be deficient through the entire low end, at least until some really deep stuff came long. When it did, what came out of the A-25's simply defied belief, for they went deeper than two of our 'standard' systems . . ." Other audio authorities concur. Julian Hirsch wrote (in Stereo Review) "At times we felt that the bass might be a trifle thin, but when the music contained low bass (under about 70 or 80 Hz), the Dynaco left no doubt of its capabilities. This led us to conclude that the 'thinness' was really a smoothness in the 100-300 Hz mid-bass range."

The widely varying impedance of conventional speakers creates inherently poor transient response, so that their poorly defined bass and midrange reduces the speaker's accuracy. It is not frequently recognized that a speaker's rated impedance is normally the minimum impedance. In actual practice, a conventional speaker system having a nominal eight ohm impedance may measure up to fifty or more ohms at certain frequencies, and over most of its audible range be far in excess of eight ohms. Such a gross variation in impedance creates a serious mismatch between the amplifier and the speaker, regardless of whether the amplifier is tube or trans-

istor. Under such conditions, a forty-watt (into eight ohms) amplifier may deliver well under ten watts because of the mismatch and the amplifier will frequently clip (distort) badly. While the speaker would not normally distort at that power level, it will reproduce the distortion of the amplifier.

The benefits accruing from maintaining a virtually constant impedance—smoother response and better power transfer from the amplifier to the speaker—are universally recognized. Some speakers use internal resistors to attempt to maintain a uniform impedance, but this method not only dissipates considerable amplifier power, but also drastically reduces the damping factor of the amplifier so that the bass response becomes muddy. The design of the Dynaco A-25 reduces resonances and smoothes the impedance characteristic by adding an acoustic impedance to the cabinet air mass. It uses a highly damped vent (not a reflex port) which is carefully controlled and adjusted. The "Q" of the system is lowered through a high friction venting action, and the amplifier is now working into a more resistive and, therefore, more linear load impedance.

The degree of damping, as controlled by the acoustic impedance, is quite critical; each A-25 is therefore individually adjusted for optimum transient response. This adjustment is made by observing the back EMF of a 5 Hz square wave which has been fed into the speaker system. Damping material is added and compressed until an optimum square wave is shown on an oscilloscope. Although no speaker system is designed to reproduce 5 Hz square waves, it is important that the overshoot on such low frequency excursions be minimized since the harmonics generated by such overshoot fall in the normal audio spectrum. It is the reduction of such spurious responses that produces the precise bass in the A-25 under transient signal conditions. As Audio Magazine observed "It was its outstanding transient response which really impressed us."

Other elements in the A-25's design contributing to its overall smoothness are the non-inductive crossover network at the relatively low frequency of 1500 Hz, the light woofer cone, and the development of a special dome tweeter. This light weight, non-rigid hemispheric radiator can handle high power levels, and maintains exceptionally uniform off-axis response, creating a large "sound source" and preserving the original spatial orientation in good stereo programming.

A five-position high frequency control is provided, as well as brackets for hanging the speaker flush on the wall if desired. The A-25's components are guaranteed for five years. Cabinet finishes are available in oiled walnut, rosewood and teak, and the grill cloth is natural beige linen. The A-25's nominal impedance is eight ohms.

"Dynaco," wrote Julian Hirsch, "has long been noted for its development of inexpensive components capable of the highest quality performance . . . (the) A-25, we are happy to note, lived up to our expectations." The Stereophile stated "We will even go so far as to say that they are probably the best buy in high fidelity today."

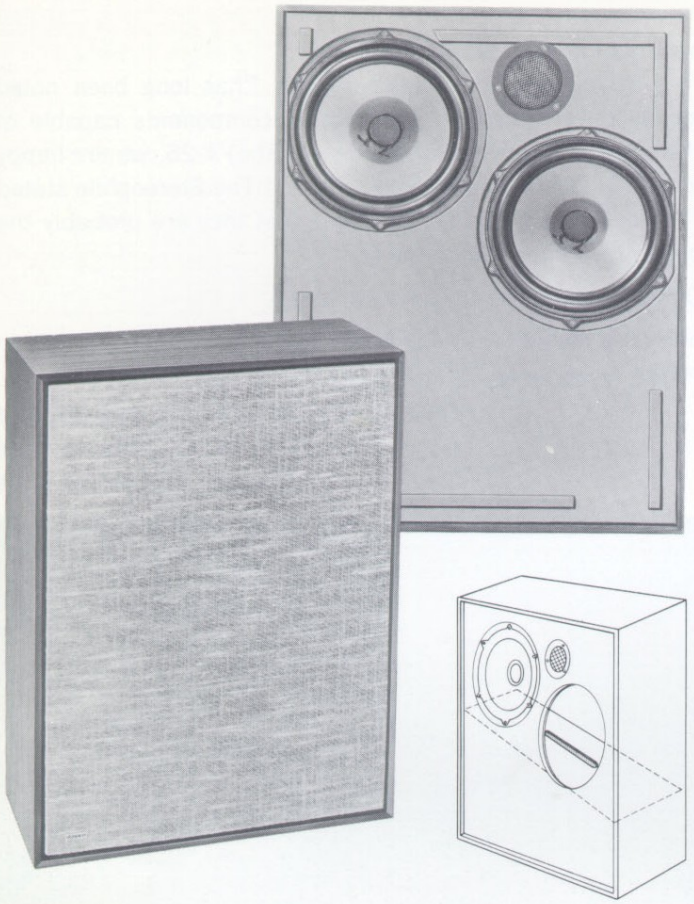
Dimensions: 20" x 11½" x 10" deep

Shipping Weight: 22 pounds (10 kg.)

PRICE (assembled only):

Oiled Walnut	**$79.95** East; $83.95 West
Rosewood	**$89.95** East; $94.45 West
Teak	**$89.95** East; $94.45 West

NEW APERIODIC LOUDSPEAKER SYSTEM A-50



The A-50 is a slimline consolette 3-speaker system which advances the aperiodic design concept initiated in the A-25. The two 10" woofers provide ⅓ more radiating area than a 12" cone, avoid mechanical instability problems, and provide a smoother crossover to the tweeter at 1000 Hz. This non-rigid hemispheric tweeter has somewhat wider range and considerably greater power handling capacity than the A-25's high frequency driver.

The internal cabinet structure is unique. Two separate chambers provide dual spectrum damping—a combination of ideal damping in the range of cone resonance, plus the benefits of a larger sealed enclosure in maintaining linearity in the lowest bass region. The two woofers are mounted in one chamber, which is vented through an acoustic impedance system into the second sealed chamber. This variable volume action of the aperiodic design lowers the "Q" of the system, and preserves an even more linear impedance characteristic than is achieved in the A-25. The result is notably superior transient response (articulation) in the bass range.

A two-way system minimizes the problems of phase and time delay distortion, interference effects, and varying sonic phenomena which characterize multi-way systems using complex crossover networks. Dynaco further designs the drivers to eliminate the need for all but the simplest crossover—a single section R-C network to divert low frequencies from the tweeter. Using a single high power, low resonance driver to handle everything above 1000 Hz provides improved dispersion and greater sonic homogeneity, contributing to the A-50's "big sound" and excellent stereo imaging. The placement of the three drivers minimizes phase and interference problems, and the normal upright position in the room puts the sound source close to the ideal ear level.

The sound quality of the A-50 is very similar to the A-25's, except that the A-50 has a slightly smoother midrange, a more authoritative deep low end, and higher overall power handling capability. These two Dynaco speaker models can be used together in the same four-dimensional [Dynaquad®] system because their electrical and sonic characteristics are so similar, and they can be used interchangeably in any music system.

The very "flat" impedance curve of the A-50 makes it an ideal load for the amplifier. Therefore, although the A-50 is not highly efficient, when maximum sound level is desired the A-50 will provide more undistorted acoustic output than other systems which have the typical large impedance variations. This will be evident when comparing the reproduction of heavy bass passages at high acoustic levels.

The A-50 may be used with amplifiers having continuous power ratings in excess of 75 watts per channel, and it is recommended that at least 25 watts rms be available. Its nominal power rating for short duration sine wave signals is 50 watts. A five-position high frequency control is provided. The finish is oiled walnut, and the grille cloth is a beige linen.

Impedance: 8 ohms.
Dimensions: 28" x 21½" x 10" deep.
Shipping weight: 47 lbs. (21.4 kg.)
PRICE (assembled only): **$179.95** East; $184.95 West.

VACUUM TUBE PREAMPLIFIERS AND POWER AMPLIFIERS

Literally hundreds of thousands of audio enthusiasts use Dynaco vacuum tube units in their music systems. The monophonic amplifiers also have gained wide acceptance as guitar amplifiers and in sound distribution systems.

The unique longevity of Dynaco equipment enables owners of monophonic power amplifiers to convert their systems to stereo with another matching amplifier even after many years have elapsed since their initial purchase.

MARK III POWER AMPLIFIER

This amplifier incorporates Dynaco Biaset for simplified adjustment and continued peak performance, without the need for critical balancing systems. Preassembled etched circuit module reduces kit construction time to about three hours.

The Mark III is also available as the Mark III-70 which includes a 70V output tap for use in sound distribution systems; and the Mark III-500, which has only 500 Ω or 125 Ω output for special laboratory applications. All versions have optional 120/240 volt power transformers.

SPECIFICATIONS

Power output @ 1000 Hz	60 watts rms
Power output @ 20 and 20,000 Hz	48 watts rms
Harmonic and IM distortion at rated output	1%
@ 1 watt	0.05%
Frequency Response, ±0.5 db	6-60,000 Hz
Hum and noise below rated output	90 db
Input sensitivity for rated output @ 1kHz	1.6 V
Input impedance	500,000 ohms
Damping Factor	15
Tubes and semiconductors	2-6550; 6AN8; GZ-34; Selenium rectifier
Dimensions	9"x9"x7" H
Shipping weight	28 lbs. (12 Kg)
Power consumption, 50-60 Hz, 120V AC	150 watts

PRICE: Mark III Kit **$ 99.95** East; $104.95 West
Mark III Assembled **$129.95** East; $134.95 West

For Mark III-70, add $10 to above prices
For Mark III-500, add $20 to above prices

PAS-3X PREAMPLIFIER

Frequency response: High Level inputs: ±0.5 db from 10 Hz to 40 kHz Low level inputs ±1 db from 20 Hz to 20 kHz (equalized).
Distortion at rated 2 volt output: Harmonic distortion: unmeasurable. IM less than 0.05%.
Hum and noise: Magnetic phono: 70 to 74 db below level of 10 mV cartridge. High level: 85 db below a 0.5 volt input signal.
Tone Control Range: ±20 db at 20 Hz. ±14 db at 20 kHz.
Maximum output: 10 Volts into 100,000 ohms or higher.
Phono overload: in excess of 250 mV.
Impedances:
Magnetic phono input: 47,000 ohms — High level input: 100,000 ohms
Tape Head input: 100,000 ohms — Audio output: 1,000 ohms
Tape output: from low level, 47,000 ohms; from high level, same as source
Required Input Impedance of Power Amplifier: Nominal load 10,000 ohms or higher.
Rear panel Inputs: RIAA phono, NAB 7½" tape head, "Special" (optional second phono, second tape head, or microphone), FM multiplex, FM-AM, Tape, Spare.
Rear panel Outputs: Audio output to power amplifier; Tape recorder output; Two switched and two unswitched AC convenience outlets.
Front panel controls: Input selector, volume, balance, 2 bass and 2 treble, stereo-mono-blend.
Front panel switches: Tape monitor, loudness compensation, scratch filter and power.
Tubes and semiconductors: 12AX7 (4), 12X4; selenium rectifier.
Dimensions: 13½" x 9" x 4¼" high (same as PAT-4).
Shipping weight: 11 lbs. (5 kg.).
Power consumption: 30 watts @ 120V, 50/60 Hz AC. 120/240 V power transformer available on special order.
Charcoal brown baked vinyl cover included.

PRICE: Kit **$ 79.95** East; $ 84.95 West
No longer available factory assembled

STEREO 70 AMPLIFIER

Power output: 70 watts rms (both channels) at 1000 Hz at 4-8-16 ohms; 56 watts rms (both channels) at 20 and 20,000 Hz. 35 watts rms (single channel driven) from 20 to 20,000 Hz.

Harmonic and IM distortion: Under 1% at rated output; under 0.05% at 1 watt average level.
Noise: More than 90 db below 35 watts on each channel (choke filtering).
Frequency response: ±0.5 db from 10 Hz to 40 kHz.
Input impedance: 500,000 ohms.
Input sensitivity: 1.3 V for 35 watts rms per channel output at 1000 Hz.
Damping Factor: 15.
Tubes and semiconductor complement: EL-34 (4), 7199 (2), GZ-34; selenium rectifier.
Dimensions: 13" x 9½" x 6½" high.
Shipping weight: 32 lbs. (14.5 kg).
Power consumption: 190 watts @ 120 V, 50/60 Hz AC. 120/240 V power transformer available on special order.

PRICE: Kit **$ 99.95** East; $104.95 West
No longer available factory assembled

STEREO 35: The Stereo 35 has essentially the same performance specifications as the Stereo 70, only at 35 watts rms total (both channels). Shipping weight: 16 lbs. (7.4 kg.) Dimensions 13" x 5½" x 4" high.

PRICE: Kit **$59.95** East; $62.95 West
Assembled **$79.95** East; $83.95 West

"Over the past decade, Dyna amplifiers have achieved an enviable reputation for uncompromised quality at bargain prices. Either in the form of easy-to-build kits or as factory-wired models, the Dyna units have consistently matched or surpassed the performance of competitive models costing far more.

"As we see it, the 'secret' of Dynaco's success has been in their refusal to incorporate gadgets or passing fads into their products. Sound engineering practice, combined with deceptively simple yet highly effective circuit design, has characterized every Dyna product we have tested over the years."

HIRSCH HOUCK LABORATORIES IN JUNE, 1967 STEREO REVIEW

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